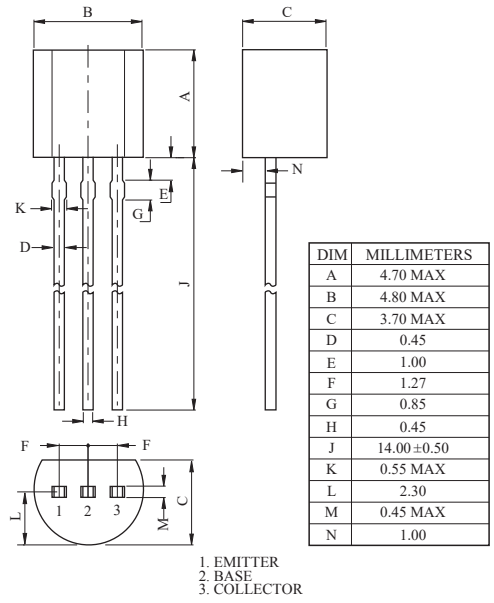
2N3904

EPITAXIAL PLANAR NPN TRANSISTOR

GENERAL PURPOSE APPLICATION.
SWITCHING APPLICATION.

FEATURES

· Low Leakage Current
  : I_{CEX}=50nA(Max.), I_{BL}=50nA(Max.)
  @V_{CE}=30V, V_{EB}=3V.
· Excellent DC Current Gain Linearity.
· Low Saturation Voltage
  : $V_{CE(sat)}$=0.3V(Max.) @I_C=50mA, I_B=5mA.
· Low Collector Output Capacitance
  : C_{ob}=4pF(Max.) @V_{CB}=5V.
· Complementary to 2N3906.



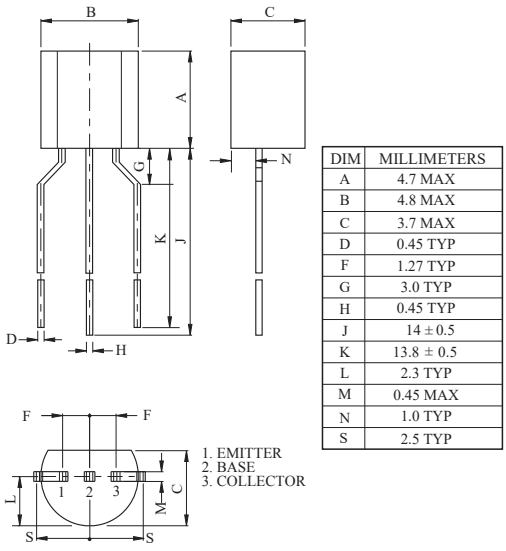
DIM	MILLIMETERS
A	4.70 MAX
B	4.80 MAX
C	3.70 MAX
D	0.45
E	1.00
F	1.27
G	0.85
H	0.45
J	14.00±0.50
K	0.55 MAX
L	2.30
M	0.45 MAX
N	1.00

TO-92

MAXIMUM RATING (Ta=25℃)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Collector-Base Voltage		V_{CBO}	60	V
Collector-Emitter Voltage		V_{CEO}	40	V
Emitter-Base Voltage		V_{EBO}	6	V
Collector Current		I_C	200	mA
Base Current		I_B	50	mA
Collector Power Dissipation	Ta=25℃	*P_C	625	mW
			400	
	Tc=25℃		1.5	W
			1.0	
Junction Temperature		T_j	150	℃
Storage Temperature Range		T_{stg}	-55～150	℃

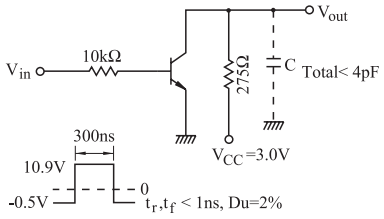
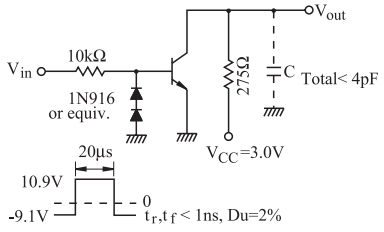
*Cu Lead-Frame : 625mW(@Ta=25℃)
1.5W(@Tc=25℃)
Fe Lead-Frame : 400mW(@Ta=25℃)
1.0W(@Tc=25℃)



DIM	MILLIMETERS
A	4.7 MAX
B	4.8 MAX
C	3.7 MAX
D	0.45 TYP
F	1.27 TYP
G	3.0 TYP
H	0.45 TYP
J	14 ± 0.5
K	13.8 ± 0.5
L	2.3 TYP
M	0.45 MAX
N	1.0 TYP
S	2.5 TYP

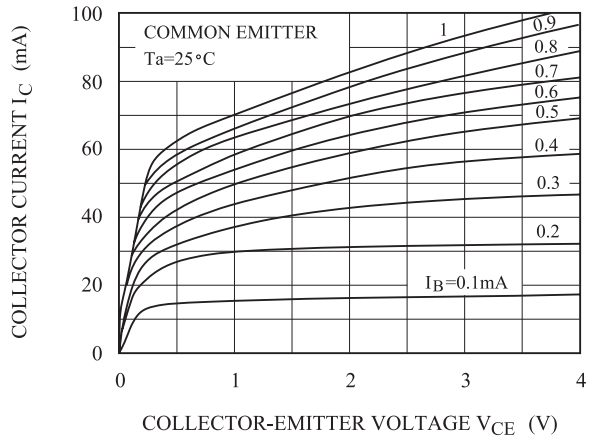
TO-92 AT TAPING TYPE

ELECTRICAL CHARACTERISTICS (Ta=25℃)

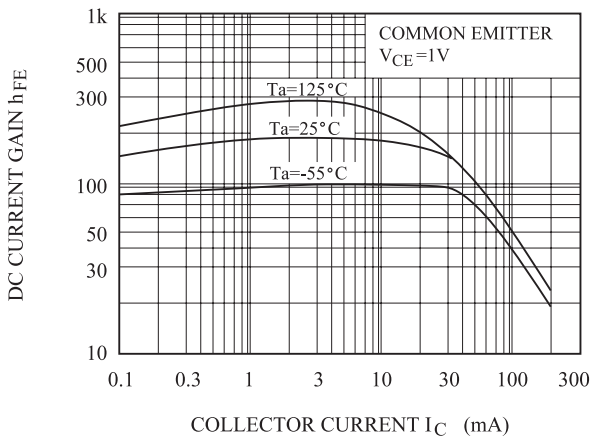
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current		I_{CEX}	V_{CE}=30V, V_{EB}=3V	-	-	50	nA
Base Cut-off Current		I_{BL}	V_{CE}=30V, V_{EB}=3V	-	-	50	nA
Collector-Base Breakdown Voltage		$V_{(BR)CBO}$	I_C=10μA, I_E=0	60	-	-	V
Collector-Emitter Breakdown Voltage *		$V_{(BR)CEO}$	I_C=1mA, I_B=0	40	-	-	V
Emitter-Base Breakdown Voltage		$V_{(BR)EBO}$	I_E=10μA, I_C=0	6.0	-	-	V
DC Current Gain *		$h_{FE}(1)$	V_{CE}=1V, I_C=0.1mA	40	-	-	
		$h_{FE}(2)$	V_{CE}=1V, I_C=1mA	70	-	-	
		$h_{FE}(3)$	V_{CE}=1V, I_C=10mA	100	-	300	
		$h_{FE}(4)$	V_{CE}=1V, I_C=50mA	60	-	-	
		$h_{FE}(5)$	V_{CE}=1V, I_C=100mA	30	-	-	
Collector-Emitter Saturation Voltage *		$V_{CE(sat)}1$	I_C=10mA, I_B=1mA	-	-	0.2	V
		$V_{CE(sat)}2$	I_C=50mA, I_B=5mA	-	-	0.3	
Base-Emitter Saturation Voltage *		$V_{BE(sat)}1$	I_C=10mA, I_B=1mA	0.65	-	0.85	V
		$V_{BE(sat)}2$	I_C=50mA, I_B=5mA	-	-	0.95	
Transition Frequency		f_T	V_{CE}=20V, I_C=10mA, f=100MHz	300	-	-	MHz
Collector Output Capacitance		C_{ob}	V_{CB}=5V, I_E=0, f=1MHz	-	-	4.0	pF
Input Capacitance		C_{ib}	V_{BE}=0.5V, I_C=0, f=1MHz	-	-	8.0	pF
Input Impedance		h_{ie}	V_{CE}=10V, I_C=1mA, f=1kHz	1.0	-	10	kΩ
Voltage Feedback Ratio		h_{re}		0.5	-	8.0	$x10^{-4}$
Small-Signal Current Gain		h_{fe}		100	-	400	
Collector Output Admittance		h_{oe}		1.0	-	40	μ℧
Noise Figure		NF	V_{CE}=5V, I_C=0.1mA Rg=1kΩ, f=10Hz~15.7kHz	-	-	5.0	dB
Switching Time	Delay Time	t_d		-	-	35	nS
	Rise Time	t_r		-	-	35	
	Storage Time	t_{stg}		-	-	200	
	Fall Time	t_f		-	-	50	

* Pulse Test : Pulse Width≦300 μS, Duty Cycle≦2%.

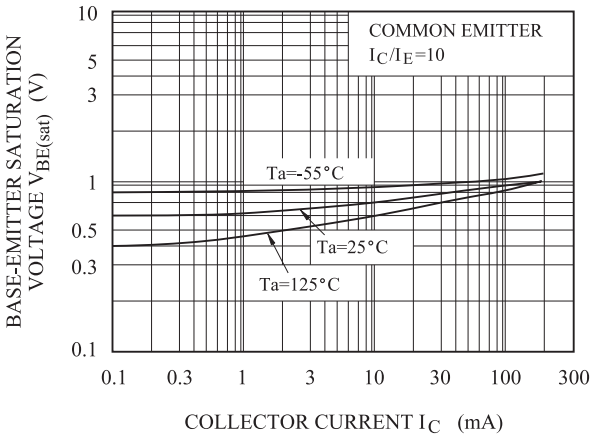
I_C - V_{CE}



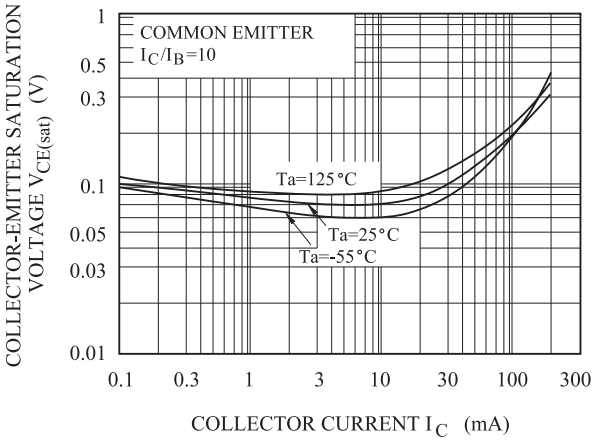
h_{FE} - I_C



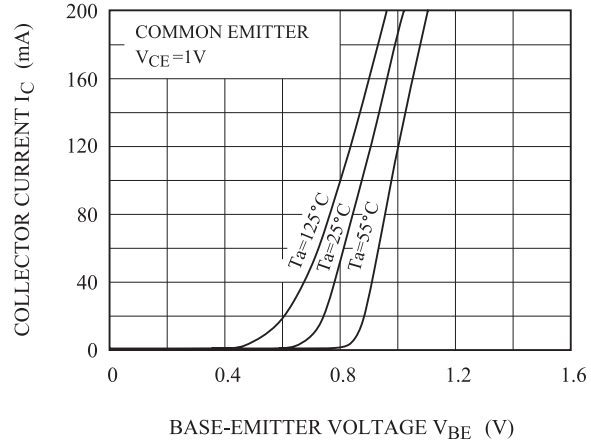
$V_{BE(sat)}$ - I_C



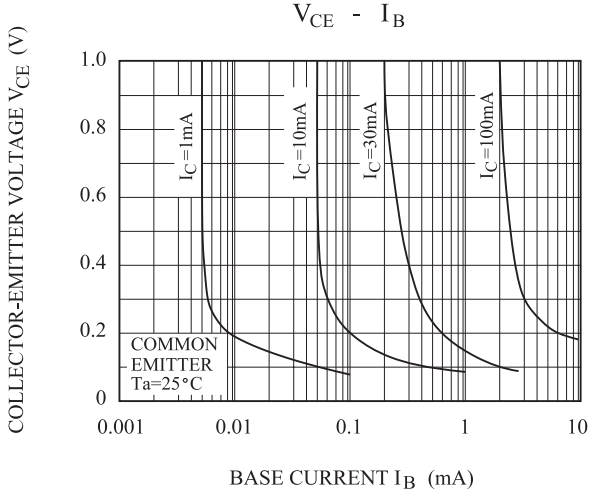
$V_{CE(sat)}$ - I_C



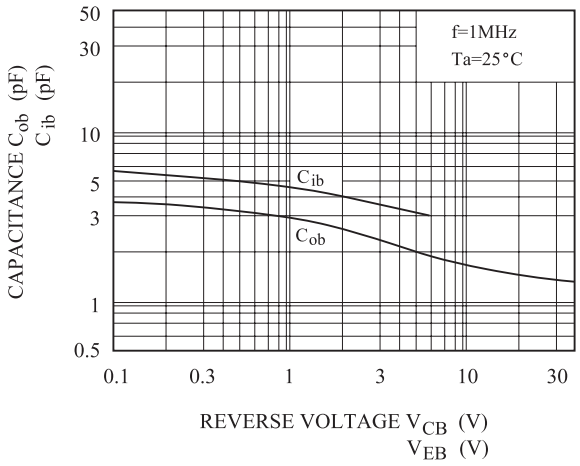
I_C - V_{BE}



V_{CE} - I_B



C_{ob} - V_{CB} , C_{ib} - V_{EB}



Pc - Ta